Application No. 10/735886
June 28, 2006
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CLMPTO

Claim 1 (Currently Amended): A multilayer interconnection structure, comprising:

a first interconnection layer including a copper interconnection pattern, said copper interconnection pattern having a top principal surface coincident to a top principal surface of said first interconnection layer and filling a trench formed in said first interconnection layer;

an interlayer insulation film formed on said first interconnection layer;

a second interconnection layer formed on said interlayer insulation film;

a via-hole formed in said interlayer insulation film so as to expose said copper interconnection pattern; and

a tungsten plug formed in said via-hole so as to connect said first interconnection layer and said second interconnection layer electrically,

said via-hole having a depth/diameter ratio of 1.25 - 3.0,

wherein there is formed a conductive nitride film between an outer wall of said tungsten plug and an inner wall of said via-hole such that said conductive nitride film is defined by an inner wall contacting with said outer wall of said tungsten plug and an outer wall contacting with said inner wall of said via-hole,

said conductive nitride film being formed of a first nitride film and a second nitride film stacked inside said first nitride film, said first nitride film having an outer surface and an inner surface, said outer surface of said first nitride film being in intimate contact with said inner wall of said via-hole, said second nitride film having an outer surface and an inner surface, said outer surface of said second nitride film being in intimate contact with said inner surface of said first nitride film, said inner surface of said second nitride film being in intimate contact with said outer surface of said tungsten plug.

Claim 2 (Canceled)

Claim 3 (Canceled)

Claim 4 (Previously Presented): The multilayer interconnection structure as claimed in claim 1, wherein said first nitride film is formed of a TaN film and said second nitride film is formed of a TiN film.

Claim 5 (Currently Amended): The multilayer interconnection structure as claimed in claim 1, wherein said nitride film has a composition with characteristics of being corrosion resistant to a fluoride gaseous source of tungsten, said fluoride gaseous source of tungsten forming said tungsten plug.

Claim 6 (Original): The multilayer interconnection structure as claimed in claim 1, wherein said second interconnection layer contains an aluminum interconnection pattern.

CLAIMS 7-17 (CANCELLED)

Claim18 (Currently Amended): A semiconductor device, comprising:

a substrate; and

a multilayer interconnection structure formed on said substrate,

said multilayer interconnection structure comprising:

a first interconnection layer including a copper interconnection pattern, said copper interconnection pattern having a top principal surface coincident to a top principal surface of said first interconnection layer and filling a trench formed in said first interconnection layer;

an interlayer insulation film formed on said first interconnection layer;

a second interconnection layer formed on said interlayer insulation film;

a via-hole formed in said interlayer insulation film so as to expose said copper interconnection pattern; and

a tungsten plug formed in said via-hole so as to connect said first interconnection layer and said second interconnection layer electrically,

said via-hole having a depth/diameter ratio of 1.25 - 3.0,

wherein there is formed a conductive nitride film between an outer wall of said tungsten plug and an inner wall of said via-hole such that said conductive nitride film is defined by an inner wall contacting with said outer wall of said tungsten plug and an outer wall contacting with said inner wall of said via-hole,

said conductive nitride film being formed of a first nitride film and a second nitride film stacked inside said first nitride film, said first nitride film having an outer surface and an inner surface, said outer surface of said first nitride film being in intimate contact with said inner wall of said via-hole, said second nitride film having an outer surface and an inner surface, said outer surface of said second nitride film being in intimate contact with said inner surface of said first nitride film, said inner surface of said second nitride film being in intimate contact with said outer surface of said tungsten plug.